
Vegetation Resources Inventory

Photo Estimation Retrofit Procedures

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Ministry of Forests
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for the
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The Resources Inventory Committee consists of representatives from various ministries and agencies of the Canadian and the British Columbia governments as well as from First Nations peoples. RIC objectives are to develop a common set of standards and procedures for the provincial resources inventories, as recommended by the Forest Resources Commission in its report "The Future of our Forests".

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Table of Contents

Acknowledgements	iii
Introduction	1
Summary of Options	3
1.0 New Delineation and Estimation	3
2.0 Retrofit	3
Retrofit Detailed Procedures	3
Aerial Photo Preparation	5
Polygon Delineation	5
Attribute Estimation	6
Data Capture (attributes and graphics)	6
Field Calibration	7
Other Issues:	9
Environmentally Sensitive Areas (ESAs)	9
Silviculture Openings	9
Appendix 1: Vegetation Resources Inventory Attribute Assignment and Mapping for Retrofit	11

Introduction

The transition of the entire Province to a Vegetation Resources Inventory (VRI) standard is an enormous task. Completion of "new" polygon delineation and attribute estimation for the entire land base could involve ten to twenty years of concerted effort. During this time a mix of standards would exist across the province which is not an ideal situation. The traditional inventory databases, for the whole province, will be digitally rolled over into a VRI database. There will be some blank fields in the VRI database as these do not currently exist in the traditional inventory databases. **It should be noted that the end result of the database rollover process is NOT a true VRI database. It is just a traditional inventory in a new database format**

The options for producing a complete VRI database are as follows:

1. **New Delineation and Estimation:** new photo interpretation for the entire area;
2. **Retrofit:** combination of existing inventory and new photo interpretation.

The selection of whether an inventory should have complete new delineation and estimation or a retrofit will result from the **Pre Inventory Assessment and business plan recommendations**. The recommendations may call for one option or a combination of the two over an inventory unit dependent upon some of the following criteria:

1. Budgets
2. Reliability of the inventory (delineation, attribute estimation and accuracy of line transfer)
3. Age of the inventory
4. Assessment of user needs
5. Additional data availability
6. Amount of land base in previously "class based - cultural" areas such as alpine forest, open range, NCBR, NPBR, etc.
7. Availability of document photos

The retrofit process is best suited to those inventory units which have had a reinventory done in the last ten years. These inventories used new standards for stratification and classification, and are likely to have a high percentage of document photos available. The retrofit will only be done on NAD83 maps, no retrofit will be done on NAD27 maps.

In addition to the standard retrofit process, the update of silvicultural information and roads can also be accomplished. However, this is a separate issue and will not be described in this document.

Summary of Options

1.0 New Delineation and Estimation

This would involve the completion of new delineation and polygon estimates for the entire landbase, using the most current photography. The latest VRI standards would be used for all steps in the process. This is an expensive and time consuming project and should only be used in those cases where the business plan and the Pre Inventory Assessment indicate that there is a problem with the existing inventory. It may also be applicable in those Timber Supply Areas that have not had a traditional reinventory in the last 10 years. These inventories are typically 25-35 years old and were not delineated or classified to current standards.

2.0 Retrofit

The retrofit process involves photo estimation and limited delineation using the existing document photos for the area. The new standards for VRI delineation and estimation are incorporated into the existing inventory. The assumption is that the current inventory is good and the goal is to fill in the gaps between the two inventories. The intent is to convert the existing database to a full VRI database by collecting the additional data required to complete the database.

The methodology will involve the following:

- field calibration to address the missing attributes and upgrading of existing attribute estimations
- there will be no new delineation in what was traditionally referred to as the productive, forested landbase, since the standards for delineation in the VRI have not changed significantly.
- existing attributes will be reviewed by the interpreter, any significant errors or interpretation differences will be noted.
- empty fields in the database will be populated by returning to the original document photos, other appropriate photography or ortho photography to interpret the attributes

Retrofit Detailed Procedures

The procedures to implement a retrofit are presented in the following section. The procedures are presented for each of the major tasks as follows:

- aerial photo preparation
- polygon delineation
- attribute estimation

Retrofit Procedures

- data capture (attributes and graphics)
- field calibration

Aerial Photo Preparation

1. determine the "document photo" set which covers the project area
2. acquire the aerial photo key maps for complete coverage of the project area
4. acquire and organize the document photos by flight lines/mapsheets
5. record any missing document photos
 - polygon boundaries can be reverse monorestituted onto new prints of the document photos
 - digital ortho update using a hard copy ortho image
6. acquire the most recent set of air photos for the area;

Polygon Delineation

New polygon delineation will be based on the criteria as set out in the current "Vegetation Resources Inventory, Photo Interpretation Procedures." Quality Assurance standards will be based on the current "Polygon Delineation Standards".

There will be no new delineation in what was traditionally referred to as the productive, forested landbase, since the standards for delineation in the VRI have not changed significantly.

The majority of the new delineation is expected to be in those types to which there was little attention paid in the past. Examples of these types would be non-forested and non-productive areas. However, specific guidelines may be established per project area depending on the pre inventory assessment and any other specific requirements.

- The Contractor will be supplied with the latest pre-VRI digital file (.fc1) to be able to identify those polygons with the old cultural definitions
- delineation of the following polygons will be conducted as necessary to meet the B.C. Land Classification Scheme which forms the basis for the polygon delineation guidelines:
 - non-forested polygons, for example NPBR, Open Range, Rock, Swamp, Alpine, etc.
 - alpine forest polygons and non-productive forested polygons
 - areas designated as "free growing" since the previous reinventory
- If alpine areas are involved in the project area, the "alpine boundary" must be interpreted onto the document photos by a qualified ecologist. This boundary is used in the BC Land Classification as the basis for Alpine designation.

- New delineation shall be marked on the even numbered photos using permanent "RED" ink
- All polygon lines to be deleted shall be cross-hatched with permanent "RED" ink
- The alpine line shall be placed on the photo using a solid ink line [fuschia, orange or fluorescent green] other than "RED" or the colour used in the original delineation.
- All polygons on a mapsheet require a unique polygon number. Polygon numbers must be placed on the even numbered photo. Existing polygon numbers will be kept whenever possible. New polygons will have the numbers identified with permanent "RED" ink. For newly delineated polygons, the Contract Officer will assign a block of polygon numbers for each mapsheet and the numbers will be assigned consecutively.
- Deleted polygons will have the number recorded on a spreadsheet with the mapsheet number identified [the numbers will not be re-used on new polygons]; the deleted number will be crossed off in "RED" ink. The list will be forwarded to the contract officer at the end of the project

Attribute Estimation

- The Contractor will be provided with a database that is in VRI format.
- All polygon attribute estimation will be based on the criteria as set out in the current "Vegetation Resources Inventory, Photo Interpretation Procedures." Quality Assurance standards will be based on the current "Photo Estimation Standards".
- A complete list of the attributes to be estimated is presented in Appendix 1, VRI Attribute Assignment and Mapping for Retrofit.
- Attributes for productive forests will remain the same. Exceptions can occur when an existing polygon boundary is modified and the attributes no longer accurately describe the modified polygon. In this case, new attributes must be interpreted.
- Errors in existing attributes must not be corrected. A list of the errors, along with new estimates, and location must be forwarded to the Contract Officer. A decision will then be made that will ensure a consistent and accurate database.
- Cultural definitions such as NP, AFor, NPBR, NCBR have been removed in the VRI. It is now necessary to describe exactly what is in the polygon.
- Attributes will be projected to the project year

Data Capture (attributes and graphics)

- the most recent spatial file and the latest pre-VRI .fcl file will be provided to the contractor
- all line work on NAD83 maps is to be captured to TRIM standards

- if TRIM control is available on the photos then data capture is by mono-restitution or higher order plotter
- if TRIM control is not on the photos, data capture will be by second order plotter or better
- all retrofit data should have some metadata to record new line work
- all database entry must meet current VRI standards
- data entry and editing software will be supplied to the Contractor.

Field Calibration

- Limited additional field work is recommended and should be concentrated on "new attributes" not previously interpreted in the inventory, i.e. second species attributes, ecological attributes, herb and shrub polygon attributes

Other Issues:

Environmentally Sensitive Areas (ESAs)

- ESAs are not a component of the VRI.
- Every polygon with an ESA classification should be assessed as to whether or not it should be combined with an adjacent polygon. If the existing attributes are the same for two adjacent polygons, with the exception of the ESA designation, then the type line between the two polygons should be deleted.

Silviculture Openings

- Every polygon on the most current version of the forest cover map must be on an air photo, or orthophoto hardcopy, so that the new attributes required for the VRI can be interpreted. For newly disturbed areas that have not yet been captured on photos, the VRI attributes that require interpretation will be left blank. They will remain blank until photo coverage is available or the blank fields are filled when Silviculture begins to collect VRI data. The only fields to be completed will be map number, polygon, BC Land Class (dummy values of VNUSL _ _) and the history attributes.
- Internal polygons within non-free growing openings must be transferred from the map onto the photo. This can be accomplished using a transfer method such as an Epidiascope, which does not meet TRIM standards.
- Free growing openings will be delineated to the new VRI standards, regardless of the existing internal polygon boundaries established by Silviculture.
- Due to the small size of the trees in many openings the estimation of attributes for secondary species, even primary species, may not be feasible. If the data cannot be collected with a reasonable degree of accuracy, the fields will be left blank.
- Standards for the size of polygons within silviculture openings varies by District. All polygons, regardless of size, will have VRI attributes estimated.

Appendix 1: Vegetation Resources Inventory Attribute Assignment and Mapping for Retrofit

(Last Revision date for this table: January 30, 1997)

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
BCGS Mapsheet Number:	MAPSHEET_ID (V,P,L,H,R)	Direct Translation
Timber Supply Area Number:	TSA NUMBER (R)	Direct Translation
Tree Farm License Number	TFL NUMBER (R)	Direct Translation
Interpreter:	N/A	Veg. Inven. Interpreter
Date: (of interpretation)	REFERENCE YEAR (L)	Year, Month
Project:	N/A	*****
Year of Photography:	N/A	Photography used in Retrofit, entered for each record

GENERAL

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Polygon Number:	FOREST-COVER POLYGON ID (P,L,H,R)	Direct Translation/New polygons added due to Retrofit
Data Source:	DATA_SRCE_CLASS_CD (L)	Direct Translation and/or add new for 1997

ECOLOGY

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Surface expression:	N/A	Photo Interpreted
Modifying Processes:	N/A	Photo Interpreted
Site Position Meso:	N/A	Photo Interpreted
Alpine designation:	NON_PRODUCTIVE DESCRIPTOR (P)	Photo Interpreted
Soil Nutrient Regime:	N?A	Photo Interpreted

LAND CLASSIFICATION

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Land Cover Component #1 Percent Coverage:	N/A	Photo Interpreted
Land Cover Component #1 Soil Moisture Regime:	N/A	Photo Interpreted
Land Cover Component #2	N/A	Photo Interpreted
Land Cover Component #2 Percent Coverage:	N/A	Photo Interpreted
Land Cover Component #2 Soil Moisture Regime:	N/A	Photo Interpreted
Land Cover Component #3:	N/A	Photo Interpreted
Land Cover Component #3 Percent Coverage:	N/A	Photo Interpreted
Land Cover Component #3 Soil Moisture Regime:	N/A	Photo Interpreted
Other Land Cover Components Percent Coverage:	N/A	Photo Interpreted

SITE INDEX

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Estimated Site Index Species:	TREE-SPECEES-CD_I (L)	Direct Translation (for NSR stands with no Tree Species, use INVENTORY_TYPE_GRO UP_NUMBER. Enter data for new polygons as required.
Estimated Site Index (metres at Age 50):	SITE_INDEX_ESTIMATED (L)	Direct Translation / Enter data for new polygons as required.
Estimated Site Index Source:	SITE_INDEX_ESTIMATED _SOURCE_CD (L)	Direct Translation

TREE SPECIFIC DATA

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Tree Cover Pattern:	N/A	Photo Interpreted
Tree Crown Closure %:	AIR CROWN_CLOSURE_PCT	Direct Translation / Enter data for new polygons as required.

SPECIES COMPOSITION

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Species #1:	TREE-SPECIES-CD_1 (L)	Calculated via VDYP * (Note species order, may change due to species percent now being based on basal area versus whole stem volume so it is not a direct translation) / Enter data for new polygons as required.
Species #1: Percent: (By Basal Area):	TREE_SPECIES_PCT_1 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #2:	TREE_SPECIES_CD_2 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #2: Percent: (By Basal Area):	TREE_SPECIES_PCT_2 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #3:	TREE_SPECIES_CD_3 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #3: Percent: (By Basal Area):	TREE_SPECIES_PCT_3 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #4:	TREE_SPECIES_CD_4 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #4: Percent: (By Basal Area):	TREE_SPECIES_PCT_4 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #5:	TREE_SPECIES_CD_5 (L)	Calculated via VDYP ** Enter data for new polygons as required.

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Species #5: Percent: (By Basal Area):	TREE_SPECIES_PCT_5 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #6:	TREE_SPECIES_CD_6 (L)	Calculated via VDYP ** Enter data for new polygons as required.
Species #6: Percent: (By Basal Area):	TREE_SPECIES_PCT_6 (L)	Calculated via VDYP ** Enter data for new polygons as required.

LEADING SPECIES

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Age (Years)	STAND-AGE (L)	Direct translation (Unless Leading species changes via BA assigned species composition) ** / Enter data for new polygons as required.
Confidence Index (Age)	N/A	Not available / Enter data for
Height (m)	STAND_HEIGHT (L)	Direct translation (Unless Leading species changes via BA assigned species composition) ** / Enter data for new polygons as required.
Confidence Index (Height):	N/A	Not available / Enter data for new polygons as required.

SECOND SPECIES

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Age (Years):	N/A	Enter data for new polygons as required.
Height (m):	N/A	Enter data for new polygons as required.

MENSURATION DATA

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Basal Area (m ² /ha):	N/A	Photo Interpreted
Confidence Index (Basal Area):	N/A	Photo Interpreted
Density (Stems/ha):	STEMS_PER_HECTARE (L)	Photo Interpreted

SHRUB

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Shrub Height (m):	N/A	Photo Interpreted
Shrub Crown Closure (%):	N/A	Photo Interpreted
Shrub Cover Pattern:	N/A	Photo Interpreted

HERB

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Herb Cover Type:	N/A	Photo Interpreted
Herb Cover Percent:	N/A	Photo Interpreted
Herb Cover Pattern:	N/A	Photo Interpreted

BRYOID

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Bryoid Cover (%)	N/A	Photo Interpreted

NON-VEGETATED

VEGETATION INVENTORY ATTRIBUTE	FOREST INVENTORY TRANSLATION LOGIC	PLANNING FILE (FIP)
Non Vegetated Cover Type:	N/A	Photo Interpreted
Non Vegetated Cover Percent:	N/A	Photo Interpreted
Non Vegetated Cover Pattern	N/A	Photo Interpreted

V - VERSION RECORD
 P - POLYGON RECORD
 L - LAYER RECORD
 H - HISTORY RECORD
 R - RESULTANT RECORD

